CLAIMS

We Claim:

1. An add-drop optical filter for removing a drop signal from a target wavelength channel of a multi-channel input signal and adding an add signal into the target wavelength channel, comprising:

input means for receiving the multi-channel input signal, the input signal comprising a plurality of input signals in a plurality of corresponding channels, and the drop signal in the target wavelength channel;

adding means for delivering the add signal at said target wavelength to the input signal;

first polarization splitter means, connected to said input port and to said adding means, for splitting each of the input, drop, and add signals into two corresponding input, drop, and add signal polarized components;

first polarization changing means for changing polarization of the add and drop signals at said target wavelength and passing all signals at other wavelengths therethrough;

a first line for delivering a first portion of said input, drop, and add signal polarized components to said first polarization changing means, such that said input signal polarized components pass through said first polarization changing means, wherein polarizations of said add and drop signal polarized components is changed;

second polarization changing means for changing polarization of the add and drop signals at said target wavelength and passing all signals at other wavelengths therethrough;

a second line for delivering a second portion of said input, drop, and add signal polarized components to said second polarization changing means, such that said input signal polarized components pass through said second polarization changing means, wherein polarization of said add and drop signal polarized components is changed;

output means for transmitting, to a first external destination, an output signal comprising a plurality of input signals in a plurality of corresponding channels and the add signal in the target wavelength channel;

drop means for transmitting the drop signal in the target wavelength channel to a second external destination; and

second polarization splitter means, connected to said first and second lines and to said output and drop means, for directing the input and add signal polarized components to said output means and for directing said drop signal polarized components to said drop means.

2. The add-drop filter of claim 1, wherein said first and said second polarization changing means comprise respective first and second chiral elements.

3. The add-drop filter of claim 2, wherein a pitch of said first and said second chiral elements is substantially equal to the wavelength of the target wavelength channel.

4. The add-drop filter of claim 2, wherein said first and said second chiral elements change said polarization of said add and drop signals at said target wavelength by 90°.

5. The add-drop filter of claim 2, wherein each of said first and said second chiral elements are selected from: a chiral fiber having single helix symmetry, a chiral fiber having double helix symmetry, and a cholesteric liquid crystal structure,

6. An add-drop optical filter for removing a drop signal from a target wavelength channel of a multi-channel input signal and adding an add signal into the target wavelength channel, comprising:

an input port operable to receive the multi-channel input signal, the input signal comprising a plurality of input signals in a plurality of corresponding channels, and the drop signal in the target wavelength channel;

an add port operable to deliver the add signal at said target wavelength to the input signal;

a first polarization splitter, connected to said input port and to said add port, operable to split each of the input, drop, and add signals into two corresponding input, drop, and add signal polarized components;

a first chiral element operable to change polarization of the add and drop signals at said target wavelength and to pass all signals at other wavelengths therethrough;

a first line that delivers a first portion of said input, drop, and add signal polarized components to said first chiral element, such that said input signal polarized components pass through said first chiral element, wherein polarization of said add and drop signal polarized components is changed;

a second chiral element operable to change polarization of the add and drop signals at said target wavelength and to pass all signals at other wavelengths therethrough;

a second line that delivers a second portion of said input, drop, and add signal polarized components to said second chiral element, such that said input signal polarized components pass through said second chiral element, wherein polarizations of said add and drop signal polarized components is changed;

an output port operable to transmit, to a first external destination, an output signal comprising a plurality of input signals in a plurality of corresponding channels and the add signal in the target wavelength channel;

a drop port operable to transmit the drop signal in the target wavelength channel to a second external destination; and

a second polarization splitter, connected to said first and second lines and to said output and drop ports, operable to direct the input and add signal polarized components to said output port and to direct said drop signal polarized components to said drop port.

7. The add-drop filter of claim 6, wherein a pitch of said first and said second chiral elements is substantially equal to the wavelength of the target wavelength channel.

8. The add-drop filter of claim 6, wherein said first and said second chiral elements change said polarization of said add and drop signals at said target wavelength by 90°.

9. The add-drop filter of claim 6, wherein each of said first and said second chiral elements are selected from: a chiral fiber having single helix symmetry, a chiral fiber having double helix symmetry, and a cholesteric liquid crystal structure,

10. A method for removing a drop signal from a target wavelength channel of a multi-channel input signal and adding an add signal into the target wavelength channel, comprising the steps of:

(a) receiving the multi-channel input signal, the input signal comprising a plurality of input signals in a plurality of corresponding channels, and the drop signal in the target wavelength channel;

(b) delivering the add signal at said target wavelength to the input signal;

(c) splitting each of the input, drop, and add signals into two corresponding input, drop, and add signal polarized components;

(d) changing polarizations of each of said two add and drop signal components at said target wavelength and passing all signals at other wavelengths therethrough;

(e) combining said changed add signal polarized components with said input signal polarized components into an output signal comprising a plurality of input signals in a plurality of corresponding channels and the add signal in the target wavelength channel;

(f) transmitting said output signal to a first external destination; and

(g) combining said changed drop signal polarized components into the drop signal; and

(h) transmitting the drop signal in the target wavelength channel to a second external destination.